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NANOTECHNOLOGY AND ARTIFICIAL INTELLIGENCE

Recently, we often come across the words artificial intelligence (AI) and nanotechnology in technological issues. The fact that we cannot fully grasp the meaning, concept, and scope of these two terms sometimes pushes us towards being cautious towards these two terms. With our project, we tried to explain the concept and scope of nanotechnology to you as much as we can. Here we will discuss how these two terms work together despite being different from each other in definition.

The concept of nanotechnology was first used in 1959 by physics scientist Richard Feynman. Nanotechnology is a field of science and engineering that designs, manufactures and uses one or more dimensions of materials on a scale of 100 nanometers or smaller. When materials have small-scale subunits, they can have many great superior properties such as high durability, thermal and electrical conductivity, and insulation. AI is a science and engineering that enables the creation of machines that can think like humans. So how are these two different fields used to serve a common purpose in our daily lives?

The development of AI has been further accelerated by the development of nanotechnology. AI was defined in 1956 by John McCarthy, a computer scientist. In order to enable AI to think like a human, a lot of information from many fields was transferred to machines using different algorithms, and then its opinion was taken on different situations and problems. In order to teach this information to the machine in a short time and to get feedback from it in a short time, the electrical-electronic units, such as mainboard, display card, hard disk, used in the machine have been equipped with excellent features with the help of nanotechnological developments, and the desired speed, durability and continuity have been achieved. Therefore, the first joint work of AI and nanotechnology took place here. Following this development, AI has started to be used jointly in many different fields, from human resources to identify suitable candidates among job applicants, to the diagnosis and treatment of diseases in medicine. So where do nanotechnology and AI meet? Let's give examples of areas where AI and nanotechnology are used in common and see that the two terms are actually not that far apart.

AI is a branch of computer science that deals with machines performing tasks that require human intelligence. Machine learning (ML), a field of AI, is a method of training algorithms using large data sets from previous examples. It is applied to find patterns and classify data or



find the optimal solution to a presented problem. Machine learning and AI in general have been used in various fields of medicine, including medical imaging and analysis of gene expression patterns. Biomedical images are segmented and combined with AI algorithms that automatically determine whether a cell is cancerous based on existing cell history data. In nano-informatics, AI and other computational methods are applied to design and implement nanomaterials. AI can provide the ability to rapidly analyze large amounts of patient data, predict disease progression, evaluate pharmacological profiles, and detect cancer biomarkers. In addition, nano-drugs produced with nanotechnology can be used for targeted drug delivery. By personally analysing patient data, artificial intelligence can create personalised treatment plans and integrate these plans with the use of nano-drugs.

Another subject area that AI can be used is imaging atomic particles. It remains difficult to obtain high-quality signals from atomic force microscopy (AFM). AI can be very helpful in solving these types of signal-related problems. AI can better analyze information and learn from the past to create a more accurate representation of any system being studied. For example, AI can minimize the level of error related to the geometry or size of a system or particle. This is especially useful for nanomaterials, as many of the effects and phenomena observed with materials such as graphene are often difficult to reproduce. AI is also extremely useful for the future of nanocomputing, i.e. computing performed using nanoscale mechanisms. Nanotechnology involves manipulating matter at the atomic or molecular scale to create new materials and devices. In agriculture, it is used for a variety of purposes, including delivering pesticides and fertilizers more effectively as well as creating sensors to monitor soil health. Integrating AI into these nanotechnology applications enables smarter, more efficient, and more environmentally friendly agricultural methods.

Artificial intelligence can analyse data from highly sensitive nano sensors used to monitor environmental conditions and collect data and can be used to extract meaningful information. For example, an AI algorithm can monitor and predict environmental changes using data from nano sensors.

For the contribution of artificial intelligence to energy efficiency, algorithms created with the artificial intelligence can automatically optimise the energy needs and usage levels of systems using electrical energy and the intensity of energy resources. Thus, less energy is consumed.

As can be seen from the examples above, AI and nanotechnology are, actually, two integral parts of a team. It is certain that they are stronger when they work together. In addition to the production and development of new materials, new medicines, new technologies in line with the information provided by AI, it may become possible to diagnose and treat events, conditions, and diseases quickly with the help of newly produced nanotechnological materials and AI. When AI and nanotechnology are well understood, many areas such as preventing famine and drought, conserving energy resources, eliminating environmental pollution, stopping climate change, discovering new worlds, and realizing interplanetary journeys will become possible for the benefit of humanity.